DOCUMENT RESUME

ED 103 407 SP 009 014

AUTHOR	Klare, George R.
TITLE	A Manual for Readable Writing.
INSTITUTION	REM Co., Glen Burnie, Md.
PUB DATE	14 Mar 75
NOTE	62p.
AVAILABLE FROM	REM Company, 119A Roesler Road, Glen Burnie, Maryland 21061 ($5.95)
EDRS PRICE	MF-$0.76 HC Not Available from EDRS. PLUS POSTAGE
DESCRIPTORS	Motivation; *Psycholinguistics; *Readability; Reading Comprehension; *Reading Research; Sentence Structure; Written Language

ABSTRACT

One of the ways to handle the increasing demands on readers' skills is to make writing more readable. The problem has two different aspects: predicting how readable writing will be to a reader, and producing writing that is readable to that reader. Prediction is relatively simple, and can be done statistically with readability formulas. Production is more complex, and involves changing words and sentences that can cause difficulty. This manual covers both aspects of the problem, with emphasis on suggestions for changes that can make writing that is designed to inform or instruct more readable. The chapters are organized in terms of a simple model in which the reader's performance is affected by the interaction of level of competence, level of motivation, and readability of writing. The suggestions made in this manual are, insofar as possible, based on recent research in psycholinguistics and readability. (Author/DDO)

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A Manual for Readable Writing

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by George R. Klare

Ohio University

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ABOUT THE AUTHOR

George R. Klare, B.A. cum laude, 1946; M.A., 1957; Ph.D., 1950, University of Minnesota, is now a Professor in the Psychology Department at Ohio University in Athens, Ohio. He has wide experience in teaching and administration. His research includes work for USAFI and U.S. Office of Education among others. His outside interests include many contributions in the fields of readability, communications and education as a consultant, writer, editor and speaker. His is listed in Who's Who in America, The Directory of British and American Writers, American Men of Science, and Dictionary of International Biography. His publications are many over the past twenty-five years in the field of readability, retention of technical training material and measurement of readability. His book, "The Measurement of Readability", Iowa State University Press, 1963, is a standard reference.

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REM Company is dedicated to the advancement of the logistics profession through the improvement of technical data. Readability is a foundation to build upon for more useful and comprehensible operator manuals, training manuals and maintenance manuals.

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Library of Congress Catalog Card Number 75-7506

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CHAPTER I

AN OVERVIEW

This chapter sums up each of the other chapters in the manual. Consider using it as a preview of organization and content before reading farther, and also as a review. The statements here will probably be meaningful as presented; however, more detail can easily be located in the appropriate chapters if needed.

FROM CHAPTER II
INTRODUCTION

One of the ways to handle the increasing demands on readers' skills is to make writing more readable. The problem has two quite different aspects: predicting how readable writing will be to a reader, and producing writing that is readable to him. Prediction is relatively simple, and can be done statistically with readability formulas. Production is more complex, and involves changing words and sentences that can cause difficulty. The manual covers both aspects of this problem, with emphasis on suggestions for changes that can make writing designed to inform or instruct more readable. The chapters are organized in terms of a simple model in which the reader's performance is affected by the interaction of his level of competence, his level of motivation, and the readability of writing.

FROM CHAPTER III
THE READER'S PERFORMANCE

"Readability" can be defined either formally or operationally (in terms of reader performance). The latter is of special interest in studies of the effect of readability. Such studies vary written material in terms of how said (style) but not what said (content). Performance is then measured in terms of reading efficiency, acceptability, comprehension, or learning of the material by the reader. Changes in the readability of the material consistently affect efficiency and acceptability, but affect comprehension and learning only under certain motivational and reading conditions.

FROM CHAPTER IV
WRITING AND REWRITING FOR READABILITY

Research suggests that making writing more readable may involve word or sentence changes (preferably both). The word changes involve content words (nouns, verbs, adjectives, ad-

verbs) much more often than function words. (Changes should not, however, involve those content words which are technical terms; if such terms are not clear, they should be defined rather than changed.) Among the word changes which can make writing more readable are:

1. greater use of words with high frequency of occurence or familiarity;
2. increased use of short words;
3. more frequent use of words with high (versus low) association-value;
4. greater use of concrete (as opposed to abstract) words;
5. increased use of active verbs (as opposed to nominalizations);
6. decreased use of unqualified anaphora (words which refer back to other words);
7. wise choice of adverbs to multiply intensity of adjectives;
8. careful choice of context around difficult words;
9. use of expressions familiar to intended readers;and
10. avoidance of unnecessary words.

Three questions can help a writer find words that might need changing: Is the word long? Will intended readers understand the word? Is the word necessary?

The research on sentence changes is sometimes contradictory, and suggests that such changes should not be overdone, since this could make writing less readable. Among the sentence changes which can make writing more readable are:

1. decrease clause and sentence length, especially where conjunctions like but, for, or because are involved;
2. use statements in preference to questions;
3. choose affirmative over negative forms;
4. select active rather than passive forms;
5. avoid self-embedded constructions, but if they are used, insert relative pronouns; and
6. avoid constructions in which the words have high depth (or "commitments" which the reader must store while reading a sentence).

The above suggestions indicate that simple, active, affirmative, declarative (or SAAD) sentences are most readable. Since they are also the most common form found in the English language, making writing more readable involves increasing their proportion in a passage.

FROM CHAPTER V
THE READER'S LEVEL OF COMPETENCE

A mature reader (in skill, not age) is described as one whose brain helps his eyes more than his eyes help his brain. As he reads, he develops expectations of what is to come, so that his eyes need only pick up minimal cues from which his brain "makes sense." Reading is thus a process of reasoning, with the reader's competence related to his knowledge of the language, his level of education, and his interest in what he is reading. The writer's job is to match the level of his writing to his reader's level of competence.

FROM CHAPTER VI
THE READER'S LEVEL OF MOTIVATION
(PLUS RELATED READING CONDITIONS)

The reader behaves according to a general principle called least effort--or, more descriptively, "expected effort" necessary for "expected reward." Consequently, his reading may vary from reading to learn to reading to forget (i.e., be diverted)--in fact, may go beyond this from "overcompensation" for very difficult writing, at one end, to "casual perusal" at the other. Motivation is likely to be greatest when interest is high, knowledge is high, and the stakes are high. Performance is then likely to be best when the reading conditions are also open enough to permit the reader to compensate for the difficulty he is meeting. The writer can do one or both of two things to encourage reading: raise the level of reward to be expected from reading a piece of writing, or reduce the effort necessary to read it.

FROM CHAPTEP VII
THE READABILITY LEVEL OF WRITTEN MATERIAL

The level of difficulty of various pieces of writing can be judged by the writer himself, by asking others to help, by testing readers to determine difficulty, or by using a readability formula. Formulas, though they measure only style difficulty and that imperfectly, are surprising good predictors. The important points are: choose a good formula and apply it accurately (by hand or computer). Formulas, however, are for rating only and not for writing; one should not "write to formula," since this is unlikely to produce the desired change in reader performance. Formulas should, instead, be used independently before and after rewriting as a check on readability.

CHAPTER II

INTRODUCTION

Reading is one of the most complex skills society asks a human to learn, and we do not understand the process very well yet. Nor do we understand, as well as we would like, how people speak and listen with comprehension. Almost all humans in all societies do learn to speak and listen well enough to get along however, while many never learn to read. Sometimes they can't help it; only between five and ten percent of the world's languages even have a written form, according to recent estimates. More of the heavily used languages have a written form, of course, but the percentage of illiterates is still growing yearly anyway, even in many of the countries using these languages.

These are problems of population and education, and we need to solve them. But are they really relevant to America's growing reading needs? In a special way, yes. The problem in America is a growing number of "functional illiterates." This term refers to persons whose reading skills are not sufficient to get along in society: to fill out forms and do the reading necessary to get and hold jobs. A 1970 Louis Harris survey found that at least 13.5 million Americans 16 years of age or older were in this category.

Here again one solution is education. The national "Right to Read" effort is a step in this direction. Unfortunately, this approach is clearly not going to be enough. One of the major reasons is that the functional literacy level keeps rising in our complex society. For example, several writers have suggested that the U.S. Army now define this level as seventh-grade reading skill, where once it was fourth-grade. Servicemen without this requisite level of skill may hold jobs, studies show, but with limited success.

Another approach is possible: make writing more "readable." In other words, change the difficulty of the style of writing so that people will find it easier to read. How can one tell whether something is more readable--whether readers can read it with ease and understanding? Most of the large body of research on readability has focused on this question. A consequence is the development of well over 50 "readability formulas" designed to predict the readability level of a piece of writing.

The evidence for the value of readable writing has in some cases been very dramatic. For example, readability

levels of newspapers and magazines may strongly affect their readership. An editor by the name of Donald R. Murphy (1947)* found increases of 45 percent to 66 percent for more readable as opposed to less readable versions in "split-run" experiments in a farm newspaper. Charles R. Swanson (1948), a journalism professor, subsequently showed that the more readable version of a newspaper article yielded the following gains over the less readable:

1. 93 percent in total paragraphs read;
2. 83 percent in mean number of paragraphs read; and
3. 82 percent in number of respondents reading each paragraph.

George R. Klare (1971) measured the readability levels of United States Armed Forces Institute (USAFI) correspondence courses, and USAFI personnel found a close relationship between these levels and the probability that students would send in all of their lessons.** Much other evidence could be cited.

If the value of readable writing is so great, why go any farther? The reading problems of America, if not the world, can already be solved! The answer, as always, is not nearly so simple. Readability can help, but it is only part of the answer and can only be used effectively in some situations. To put it most simply, readable writing can only help those who read. Non-readers are excluded, of course, but so also are some readers: those not motivated enough to begin. Even some who begin a piece of writing are excluded: those who find it too long or who dislike it for some other reason. In such cases, readability alone is not the answer. The critical questions concern where, when and how it can help, which are major issues in this manual.

There is a related question: how can one write readably? As mentioned above, most of the research on readable writing concerns predicting it by formula or measuring it, not producing it. Prediction is not easy, with reading as complex as it is. But compared to production--to writing--it is much easier. There are several reasons for this.

A researcher who wishes to predict how readable writing is can be content to look for "index" variables, or elements, in language. He wants to find simple elements of style whose counts reflect difficulty. A researcher who wishes to produce readable writing, on the other hand, must look for

*The names and the numbers in parentheses refer to items in the reference list.

**Personal correspondence with Dr. Kim Smart, USAFI. A rank-order correlation of .87 was computed, with length of course held constant.

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"causal" variables in language. He wants to find elements in language whose change actually makes writing easier or harder for readers. Unfortunately, text (or prose generally) is difficult to experiment with. One problem is discovering what aspects can be usefully changed. Even when they can be found there is the added problem that the changes may result in stilted prose, or that they may be trivial. The producer of readable writing may, in his experimentation, "hold variables constant" that are of great importance to a reader and come up with variables of dubious value to a writer.

To predict readable writing is, once again, easier than to produce it. Why not, then, turn to the many writers who have written about their craft over the years? Their experience must certainly have led to some shrewd suggestions. Anyone familiar with Strunk and White's The Elements of Style (1972) will recognize this. Another personal favorite is a chapter of Bertrand Russell's called "How I Write" (1961). He suggests:

1. not using a long word when a short one will do;
2. that one wanting to write a sentence with many qualifications should put some of the qualifications in separate sentences; and
3. not letting the beginning of a sentence lead the reader to an expectation contradicted by the end of it.

Much research as well as good practice has stemmed from such sources. Cleverly worded suggestions stick in one's mind well enough to be around when needed. A good example comes from The News Letter of The Ohio State University, by way of the Education Reporter (1970).

> Rules for writing: Don't use no double negative. Make each pronoun agree with their antecedent. Join clauses good, like a conjunction should. About them sentence fragments. When dangling, watch your participles. Verbs has to agree with their subjects. Just between you and I, case is important too. Don't write run-on sentences they are hard to read. Don't use commas they aren't necessary. Try to not ever split infinitives.
> It's important to use apostrophe's correctly. Proofread your writing to see if any words out. Correct speling is esential.

There are many books about writing well, and many times that number of suggestions (some of them contradictory). Partly this is a matter of the complexity of the English language, and partly because the writers had different audiences and purposes in mind.

Why, then, another publication? Because it will, hopefully, have something different to say. Here are the reasons.

1. This manual concentrates on readability in writing. It does not pretend to cover the many other points of grammar, spelling, punctuation, organization and production a writer needs to know. This manual can not, in other words, take the place of a handbook or the usual desk references.

2. The suggestions in this manual are intended for writing whose purpose is to inform or instruct. There are many other possible purposes for writing, such as creation of a mood, poetic statement, mystery, etc., and the suggestions will be inappropriate for many of them.

3. The manual presents a view of how the mature reader reads. The term "mature" refers only to the fact that the reader is no longer a beginner in reading; it does not refer to age as such. The purpose of this description is to provide background for some of the manual's suggestions and why they work.

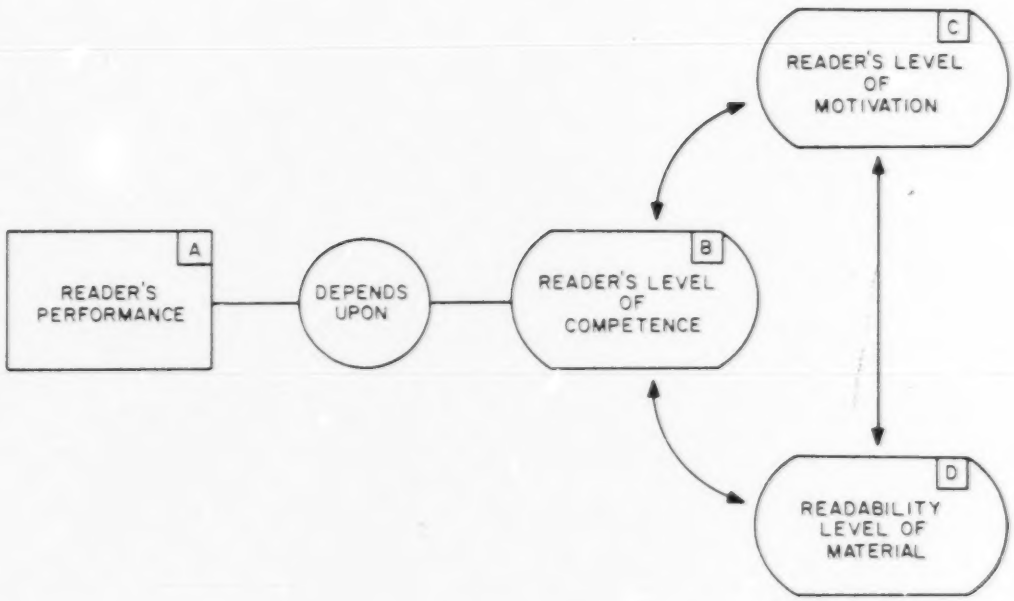
4. The suggestions themselves are, insofar as possible, based upon recent research in psycholinguistics and readability. These related fields are rapidly growing and changing as new research complements, alters, or even contradicts the old (a personal collection of relevant references in the above areas is well over 10,000, most of them published within the last ten years). There are several consequences of this approach:

   a. The suggestions should be considered as suggestions, not rules. There are times when they will not apply, and can even be detrimental. The complexity of the English language would make this so even if the rapid growth in the source fields did not. Together they emphasize that these may be the latest suggestions (for a time, at least), but not the last words. Each writer must decide when they are inappropriate, as well as when they fit.

b. The suggestions in the manual are limited in scope by the available research; many important considerations in writing are not even touched upon.

5. The manual is, to the extent possible, applied in approach. Users and evaluaters of an early draft of it felt that too much philosophizing discouraged the reader.

6. The manual has been organized largely around a simple model of reader performance. The model may be pictured as follows:



As the model suggests, (A) a reader's performance (e.g., speed and comprehension) depends upon the interaction of (B) his level of competence, (C) his level of motivation, and (D) the readability level of the material he is reading. Each of the units, A through D, forms the basis of a chapter. Under A (Chapter III), the common indices of reader performance are described, along with suggestions on when and how they are usually used. The statement that writing can be called readable only when it is readable to an intended reader summarizes this section well. The following chapter (IV) is devoted to variables and techniques useful for writing and rewriting for readability. This key section can be used independently of the others--in fact, the brief version of this material in the summary (Chapter I) may be sufficient after a first reading of the chapter itself. Under B (Chapter V), the material centers upon how the mature reader reads, with emphasis on the notion that "reading is only incidentally visual," as Paul Kolers (1969) put it so well. Under C (Chapter VI), the range of reader motivation from casual perusal to "over-compensation" is described. The statement that reader motivation ranges from "reading to learn" to "reading to forget" is an apt one here. Under D (Chapter VII) the appropriate use of formulas to assess readability level is described.

The emphasis throughout the manual is upon how many readers can be helped, and how much, by a writer's efforts at writing more readably. As Edmund Berkeley once put it, 8 hours of a writer's time might well save 10,000 readers 10,000 hours of time!

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CHAPTER III

THE READER'S PERFORMANCE

The term "readability" can be given two definitions, formal and operational. The first of these is a dictionary type of definition, useful for a quick characterization. Webster's New World Dictionary of the American Language (Guralnik, 1970) says something is readable if it is "interesting or easy to read." This is the type of definition most often used.

The second type, operational, defines readability in terms of its effects upon readers. How does a reader's performance change when he reads something that is more readable as opposed to something less readable? A definition of this type is naturally of special importance to a chapter called "Reader Performance."

Before we can define readability this way, however, we need to consider several points. When we make a change in the readability of a passage to observe its effect upon reader performance, what kind of change do we mean? We must avoid changing what is said, or content. Instead, we change only how it is said, or style variables, such as familiarity or concreteness of the words used, or sentence length. Changes of this sort will be discussed more fully in the next chapter; the point here is that unless we change only style variables, we are unable to tell what caused the changes in the reader's performance or even if he is still learning what he should be learning.

Some writers have argued that words cannot be changed without also changing meaning; others have argued that they can. Some synonyms or synonymous phrases may well introduce minor changes in meaning, but such changes will be considered acceptable. After all, readers differ among themselves in their interpretations of what a writer means, and few (if any) get precisely the meaning the writer intended. Consequently, we need be concerned only about clear-cut alterations in meaning. The English language, fortunately, is particularly rich in synonymous words and phrases. In addition to the two major streams of words, those of Latin and those of Anglo-Saxon origin, English has borrowed words rather freely from other languages.

Sentence changes can also often be made with little or no change in meaning. Transformational grammar, to be touched on

in the next chapter, has been helpful in describing the various sentence forms. Consequently, we can assume that changes in how something is said (structure) need not significantly change what is said (content).

With the structure-content distinction made, we can turn to the kinds of changes to be expected in reader performance. At least two dozen methods of measuring performance changes have been used. Not all will be described; instead, four major categories will be used and the more common methods listed under each.

1. Reader efficiency. The most common measure is reading speed in number of minutes or seconds for a passage of given length. Number of visual fixations or regressions may be used, but the equipment needed usually rules these out. Sometimes such measures are combined with measures of comprehension, in order to get an efficiency index.

2. Reader acceptability. This is a broad category in which acceptability is shown either directly or indirectly by readers. The direct measure is most often a judgment by readers of whether passage A or passage B (or C or D) is easier (or easiest) to read. Indirect measures take several forms, and are usually of even more interest than direct. In the case of comparisons of magazine or newspaper articles, the most common method of measurement is readership. The comparison in this case is usually made on the basis of a "split-run," in which one sample of readers gets one version of the material and a second sample gets the other. Number of readers of each (determined by an interview or similar arrangement) is the index of interest. Sometimes a method is used which involves reader "persistence." In the case of magazine or newspaper articles, the measure usually involves depth of readership--how far into the material the reader reads. In the case of correspondence course material, the measure may be number of students who complete lessons and/or entire courses. Acceptability is a good measure to use in "free-reading" situations, where there is little or no pressure to complete material. Most adult reading is of this sort, rather than a formal reading situation.

3. Reader comprehension. The measure most often used here is the common multiple-choice question. Recently, however, the "cloze"procedure has become popular because of its simplicity. A cloze passage is one in which every nth word (almost always every

5th word) has been deleted and replaced by a standard-sized blank. The reader is asked to fill in the blanks. Cloze scores on a passage are usually quite highly related to multiple-choice scores of readers. A different kind of measure involves the time a reader needs in order to read and verify the truth or falsity of a statement or to read about and carry out a task requested in a statement or paragraph. The presumption is that the more readable version yields shorter times than the less readable. A final measure worth mentioning is paraphrase. Here the reader gives the meaning of a sentence or paragraph "in his own words." This method is seldom used except in translation studies because paraphrases are difficult to score.

4. Reader learning and retention. This category is sometimes included under comprehension, but the measures used are different enough to be separately placed. Furthermore, as one writer says, it is possible to learn a string of words without comprehending it, but comprehension helps. Similarly, it is possible to comprehend a string of words without retaining them. The most common measures of learning and retention are recall (i.e., memorization) and recognition (indicating whether or not something has been seen before).

There are two reasons for presenting the various categories of measures. First, to discuss, below, the kinds of reader behavior most likely to be affected by changes in readability. Second, to provide background for discussing how to make changes in readability, and the probable effects of such changes, in the following chapter.

Reviewing the many studies of the effectiveness of readability in changing reader performance yields the following general conclusions.

1. In almost all cases, improved readability results in greater reading efficiency, whether measured by time or eye-movement measures. More readable words tend to be shorter than their less readable counterparts (as indicated in the next chapter); consequently, a more readable passage tends to be read faster than a less readable passage with the same number of words. In addition, however, more readable words are perceived (recognized) faster than less readable words of equal length. The simpler sentences of more readable material also add to the reader's efficiency, making this a primary change in behavior resulting from changed readability.

2. In almost all cases, improved readability results in increased reader acceptability. With direct measures (judgments), readers are quite capable of distinguishing highly readable from highly unreadable material. They must certainly make a similar judgment when indirect measures are used, resulting in greater readership and persistence in the case of more readable materials. Since there is considerable competition for the reader's time--from the multitude of other reading materials available, from TV, from radio, etc.--ease of reading becomes a major factor in determining his behavior.

3. In many cases, improved readability brings increased comprehension, but not in all. The reason seems to lie chiefly in the reader's motivation and the circumstances under which he is reading, as described in Chapter VI. If motivation is very high and time available, he will compensate for material that is low in readability through greater effort. When motivation is lower, and/or the reader has limited time (or limits his time), more readable material brings increased comprehension compared to less readable material.

4. Only a few studies of the effect of readability on learning are available. They suggest that learning is affected in much the same way as comprehension.

The question to keep in mind is what you as a writer are interested in. Efficiency and acceptability are more readily affected by changes in readability than degree of comprehension and learning, especially under conditions of high motivation. In Chapter IV we will look at language variables that can be changed to improve readability. Their effects will be summarized in terms of the measures described in this chapter.

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CHAPTER IV

WRITING AND REWRITING FOR READABILITY

A number of suggestions will be given in this chapter for writing readably. They are based upon recent findings in psycholinguistics and readability, in both of which there is very active research. They are therefore suggestions, not rules. They must be applied with discretion; mechanical application may be more harmful than helpful. Furthermore, the suggestions given are not the only important components of writing--even of writing designed primarily to be readable. When you rewrite material to make it more readable, you may well need to make other changes--in organization, emphasis, inclusion of examples, etc.--in addition to those described in this chapter. The number of suggested changes is limited because only those variables having a research basis are included, and the relevant research itself is limited. As you will see, they consist of word and sentence variables only. So far, attempts to isolate meaningful variables for paragraph construction and usage have not progressed very far. Nor have studies of organization or emphasis provided much useful research data for writers.

The suggestions for using word and sentence variables can be applied either in original writing or in rewriting material to make it more readable. The need for more readable writing may in some cases be obvious to a writer as he goes along. In others, readability formula scores or intended readers' competence or motivation--or all three-- may indicate the need. Applying the suggestions in writing or rewriting is much the same process, except that in writing one may "select" words or sentence structures and in rewriting one usually "changes" them. Phrasing all the suggestions both ways would be clumsy. Only "changes" will be used; the word is more general and will apply both to a writer changing his original writing or editing someone else's.

Word Changes

Before discussing word changes, a distinction needs to be made between "content" words and "function" words. The former refers to nouns, verbs, adjectives, and adverbs; the latter refers to all other categories (articles, prepositions, conjunctions, etc.). Function words may be roughly defined as those words not capitalized in titles. The distinction between the two kinds of words is important because most of the word changes described below apply only to content words. In

fact, some apply more appropriately to nouns and adjectives than to verbs and adverbs. Unfortunately for our purposes, less research has been done to date with verbs and adverbs than with nouns and adjectives; the most research of all has been done with nouns alone.

Six word changes, or variables, are listed briefly below. Specific steps for using them in writing or rewriting follow the listing. Additional technical information for those who wish it is summarized in Table I, Some Word Difficulty Variables. The references given are only a partial list of those available. They are meant to be illustrative of the general research findings, and as such contain some qualified results along with the positive ones. The word variables listed tend to be related to each other, i.e., frequently used words are usually shorter than those infrequently used. The variables are not perfectly related, however, which is why each is discussed separately.

1. Word frequency and familiarity. Words of high (versus low) frequency and/or familiarity contribute to more readable writing; found for nouns particularly, but also for other content words. Compare meal with repast, household with menage, leave with depart, count with reckon.

2. Word length. Shorter words (versus longer) tend to make writing more readable; generally found for content words, but sometimes also for function words. Examples are owner versus proprietor, go versus proceed, bloody versus sanguinary, too versus additionally.

3. Association value. Words which call up other words quickly and easily add to readability of writing more than those which do not; studies made with nouns chiefly, but several with adjectives. Girl brings boy to mind more quickly than man, hand suggests foot sooner than leg, and sleepy suggests drowsy before heavy; love calls up associations more easily than amour, and law more quickly than decree.

4. Concreteness-abstractness. Concrete words, which easily arouse an image in one's mind, contribute more to readable writing than words which do not (abstract words); studies made with nouns. Winston Churchill must have known instinctively about this he chose blood, sweat, toil, and tears over something like bravery, energy, and sadness. Some politicians like to use abstract words like victory and

heroism, whereas their hearers are more likely to visualize and remember village and hospital. But the difference is easy to miss: time is abstract while timepiece (or clock) are concrete. Adjectives have been scaled for the related quality of vividness. Savage is more vivid than heartless, for example, and filthy than soiled.

5. Active verbs versus nominalizations. The active verb form tends to make writing more readable than the nominalized form; nominalizations are words (usually verbs) made into noun form. Consider may thus become the consideration of, oppose become the opposition to, or suppose become the supposition that.

6. Pronouns and other anaphora. Anaphora are words or phrases which refer back to a previous word or unit of text; both clarifying what they refer to and limiting their use help to make writing more readable (more research evidence is needed however).

   Examples of anaphora, besides pronouns such as he and she or that and which, are phrases like the above or defined earlier or in the third paragraph.

Several other word variables might have been added, notably: the absence (versus the presence) of affixed morphemes (prefixes and suffixes); and, use of words of Anglo-Saxon (as opposed to Latin) origin. These variables are highly related to one or more of the others listed, and are not as easy to apply, so they have not been given separate listing.

How can the six word variables be put to work by a writer who wishes to use easier (more readable) words in place of harder (less readable)? A suggested series of steps is given below. A few words of qualification are needed first, however. To begin, not all potentially hard words should be changed; some cannot be without an undesirable change of meaning. In addition, a good or better substitute word (or short phrase) cannot always be found or be inserted without undesirable sentence changes. Good editorial opinion is essential, and the final arbiter. Where the following steps do suggest useful substitutions, however, a change of words can help to make writing more readable.

1. When going through the passage, check the content words (especially nouns) likely to be difficult. A good rough index is length in syllables or letters.

2. Avoid changing technical or similar special-meaning terms (if any). Better substitutes cannot usually be found for them. Instead, provide

TABLE I

SOME WORD DIFFICULTY VARIABLES

Variable	Performance Score(s)	References: Name and Date	Comment
1. Word frequency and familiarity, especially of nouns	Reading efficiency; reader judgments; for nouns, particularly, con-	Klare, 1968 (review); Coleman, 1971; Elley, 1969; see also Gorman, 1961, and Thorndike and Garrettson, unpublished	Words of high (versus low) frequency of occurrence and familiarity result in: increased reading efficiency (recognition time) and reader preferences. However, frequency of content (versus function) words, particularly nouns, seems to provide the relationship to comprehension and performance.
2. Word length	Reading speed and fixations; cloze comprehension scores and information gain	Klare, 1968 (review); see also Bormuth, 1966, Coleman and Miller, 1968, and Coleman, 1971	Review shows use of shorter (versus longer) words results in faster recognition time and reading speed, fewer fixations; also, shorter words related to higher cloze comprehension scores and information gain.
3. Association value	Reading speed, comprehension, and learning	Coleman, 1965; Rosenberg, 1966; Samuels, 1968	Use of high(versus low) association value words (particularly nouns and adjectives) results in increased reading speed, comprehension, and learning.
4. Concreteness-abstractness	Recognition memory, judgments of readability, and sentence usuage; also, information gain	Gorman, 1961; Dukes and Bastian, 1966; Thorndike and Garrettson, unpublished; see also Elley, 1969, and Coleman, 1963 and 1971	Concreteness (versus abstractness) of words results in increased recognition memory and readability judgments, more correct sentence usage, and greater information gain. (Concrete words defined as those which arouse a sensory image.)

Table I (continued)

Variable	Performance Score(s)	References: Name and Date	Comment
5. Active verbs versus nominalizations	Comprehension, cloze and multiple-choice; recall; information gain	Coleman and Blumenfeld, 1963; Coleman, 1964, 1965 1968; Rohrman, 1968	Sentences using nominalizations more difficult to comprehend and recall than those using active verbs; subject nominalizations recalled better than object nominalizations.
6. Pronouns and other anaphora	Cloze scores	Coleman, 1971; Bormuth, 1966 and 1969	Some evidence that increased use of pronouns, and particularly of all anaphora, relate to difficulty.

definitions along with the terms if they are unlikely to be familiar to the intended reader (e.g., have not been defined before).

3. Look for several more frequent or familiar substitutes (single words or short phrases) for the difficult content words. Several sources are available.

   a. One's own knowledge can often serve. Studies show that we tend to think of more frequent synonyms for words before we think of less frequent.

   b. A good place to find substitutes when necessary is a dictionary specifically set up to give definition words of highest frequency of occurrence first. Two good sources are the Thorndike-Barnhart Handy Dictionary and The American College Dictionary. Other interesting but not as readily available sources are Michael West's The New Method English Dictionary Explaining the Meaning of 24,000 Items Within a Vocabulary of 1,490 Words or his A General Service List of English Words. The latter classifies the commonest 2,000 words in terms of the frequency of their different meanings, and in the process provides common synonyms.

   c. As always, a thesaurus or dictionary of synonyms provides still more words. Good possibilities are The New American Roget's College Thesaurus and Soule's Dictionary of English Synonyms. If using such a source, a check on frequency is sometimes desirable. Throndike and Lorge's The Teacher's Word Book of 30,000 Words is an easy way to make a check. There have been some questions of the adequacy of its sampling and of the currency of the words. For a more recent count, especially appropriate for adult usage, Kucera and Francis's Computational Analysis of Present-Day American English is preferable.

4. From among the several possible substitutes located, check to see which one (or more) of them satisfies one (or more) of the following qualifications:

   a. Is highly concrete. Does a word describe an object that can be perceived by the senses? Does it refer to a person, place, or thing that can be seen, heard, felt, smelled, or tasted? Does it have a relatively direct reference to objects, to material, or to sources of sensation? If yes on one or more counts, the word is concrete and likely to be more readable than one which does

not qualify. Compare, for example, key versus effect, or sailor versus anyone. The psychologists Otfried Spreen and Rudolph Schulz (1966) have compiled a list of 329 nouns that vary in concreteness; Allan Paivio, John Yuille, and Stephen Madigan (1968) have provided a list of 329 nouns varying both in concreteness and the closely related quality of imagery. Howard Walker (1970) has developed imagery ratings for 338 nouns. C. Hess Haagen (1949) considers an adjective vivid if it leaves a clear or graphic impression, which appears similar to the definition of concreteness in nouns. He has provided vividness ratings of 400 pairs of common adjectives. Compare, for example, how much more vivid frantic is than confused, or putrid is than impure.

b. Has a high association-value, particularly with another word used in the passage. This can be roughly determined from one's own experience (e.g., green-grass and go-fast are higher in association-value than green-house, or go-quickly. These values vary somewhat according to the reader's grade level. To find a high-associate word for the various grades, a good source of information is David Palermo and James J. Jenkins's Word Association Norms, Grade School through College (1964). Another source of data is Leo Postman and Geoffrey Keppel's Norms of Word Association (1970). The 925 nouns of Paivio, Yuille, and Madigan (1968) have also been rated for meaningfulness (i.e., association-value). Compare arm versus forehead in terms of how many associations each elicits, or nail versus keg. The association value of 400 pairs of common adjectives may be found in the list prepared by Haagen (1949). Some examples are: frigid is rated as much more closely associated to icy than to gelid, and liquid to fluid more than to limpid.

c. When possible, choose a word one of whose common (rather than uncommon) meanings is called for. Two things help one to do this: the human tendency to think first of common rather than uncommon meanings and the context (see item 8 below). For example, run is said to have at least 97 different dictionary meanings, ranging from go faster than walking to manage a business, from a run of one mile to a run on the bank, from run up to run down. You can easily call up the most common ones, but the less common come only

with difficulty. The same is true for a reader, unless the context is especially clear. If you want help, the Thorndike-Barnhart Handy Dictionary and the American College Dictionary list definitions roughly in order of their commonality.

d. To provide an idea of how high frequency nouns that are concrete and have high association-value differ from those that are less concrete and have lower association-value, consider the two groups: (1) bread, sheep, teeth, breakfast, diamond; (2) fate, fault, custom, presence, circumstance.

e. If none of the above factors (concreteness, association-value, common meaning, or frequency) can be applied, chose the shorter word as measured by either syllable or letter length. There is a tendency for length to be related to the above variables, anyway.

5. Change nominalizations, where possible, to their active verb counterparts. An example would be the change from Noah's construction of the ark to Noah constructed the ark or, still better, Noah built the ark. Others would be Marilyn's application of the suntan oil to Marilyn applied the suntan oil and John's derivation of the formula to John derived the formula.

6. Review the anaphoric constructions to see if they should be expanded. Where a pronoun is used, substitute its noun referent if you feel the reader needs help. Look for phrases or clauses such as The previous example or The above paragraph showed why and add qualifiers if necessary, such as The previous example of concrete words or The above paragraph on association-value showed why.

7. Choose adverbs carefully to show the desired degree of intensity. A study by Norman Cliff (1959) indicates that readers are highly consistent in saying how much a particular adverb (e.g., slightly versus very multiplies the intensity of adjectives (such as evil or charming). The typical rank from low intensity to high is:

   (1) slightly modifying the adjective = least multiplication

   (2) somewhat

   (3) rather

   (4) pretty

(5) quite modifying the adjective
= average multiplication

(6) decidedly modifying the adjective

(7) unusually

(8) very

(9) extremely modifying the adjective = greatest multiplication

The unmodified adjective usually was found at about the rank of quite or decidedly.

8. Keep in mind that when a reader encounters a difficult word, the four or so words on each side of it are critical. This is the case for a reader trying to find a substitute for the word, determine which of the word's several meanings is intended, or guess the word (when a blank has replaced it). Note how the meaning of type is determined by the words surrounding it in the following four examples: is a face of the type that he can show; he shows it is type of a face that can; shows that he can type a face of the; and shows that he can type it if the faces of. It is therefore important that the four or so words in the neighborhood of a critical term be understandable and helpful.

9. Terms or expressions known to be highly familiar to an intended reading audience are exceptions to the above steps; they should be used, of course, even though they are relatively unfamiliar to others. For example, some terms (fronting, shortneck)* may not meet the qualifications described and yet be clear to unskilled readers (or better yet, hearers) in Roxbury or Harlem or Watts. When examples or analogies are used in writing, they can be more effective if they are situations familiar to the intended reader and related to his interests.

10. Avoid unnecessary words. This suggestion, commonly given in books on writing, is particularly important for readable writing. "Brevity consistent with clarity" contributes to reading speed (efficiency) and to depth of reading.

*Fronting means pretending; shortneck refers to a small bottle of wine.

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11. To summarize briefly, a writer can usually find words that need changing by keeping these questions in mind as he reads:

    a. Is the word long?

    b. Will intended readers know the word?

    c. Is the word necessary?

Word changes alone are clearly not enough in most cases of revision. To be sure, they cannot even be made alone on many occasions (as when changing nominalizations to active verbs). Changing phrases, clauses, or other sentence structures is often also necessary. The next section deals with such changes within sentences.

Sentence Changes

The sentence changes to be described involve the following six variables listed briefly below. Specific steps for using them in writing or rewriting follow the listing, along with further definition of the variables. Additional research information for those who desire it is given in Table 2, Some Sentence Difficulty Variables.

1. Length. Shortened sentences and clauses (to be described later) contribute to more readable writing.

2. Statement versus question constructions. Statements tend to produce better recall than questions.

3. Affirmative versus negative statements. Positive constructions are likely to be verified more quickly and with fewer errors than negative (i.e., those with not or other negative words).

4. Active versus passive statements. The active form of statement leads to easier recall and verification than the passive form.

5. Self-embedded versus non-embedded constructions. Self embedded statements (i.e., those with repeated parts within parallel elements in the sentence, to be illustrated later) greatly reduce readability compared to non-embedded alternatives.

6. Depth of words in sentences. Greater word depths (i.e., words with more "commitments" the reader must store while reading) make writing less readable.

Before suggesting how the above variables can be put to use, a few preliminary words are in order. Many of the changes described below come from studies using transformational grammar.

Table 2

SOME SENTENCE DIFFICULTY VARIABLES

Variables	Performance Score(s)	References: Name and Date	Comment
1. Length (including clause length)	Comprehension, cloze scores and time	Coleman, 1962, 1965; and 1971; Gough, 1966; Stoodt, 1972	Certain changes in sentence length are effective (e.g., dividing sentences joined by conjunctions such as but, for, because, etc.), but others have little effect; clause length as important as sentence length, and changing clauses to full sentences effective.
2. Statements versus questions	Recall	Mehler, 1963; Savin and Perchonock, 1965	Recall better for statements than questions (in either active or passive form).
3. Affirmative versus negative statements	Verification (by observation) of truth or falsity	Gough, 1965 and 1966; Slobin, 1966	Negative statements required more time or caused more errors in verification (using a true-false test) than affirmative statements.
4. Active versus passive statements	Verification; recall	Mehler, 1963; Coleman, 1965; Gough, 1965 and 1966; Prentice, 1966; Slobin, 1968; Blount and Johnson, 1973	Active statements verified more readily and retained better than passive statements (this appears more clearly for reversible than nonreversible statements, for full than truncated passives, and for sentences where events are presented in the correct temporal order).
5. Embeddedness	Cloze scores and paraphrases for comprehension	Coleman, 1965; Schlesinger, 1966; Blumenthal, 1966; Hakes and Cairns, 1970; Hamilton and Deese, 1971	Self-embedded sentences cause the reader difficulty; inserting relative pronouns helps, but a right-branching construction is preferred.

Table 2 (continued)

Variables	Performance Score(s)	References: Name and Date	Comment
6. Depth	Cloze scores; recall	Bormuth, 1964 and 1966; Martin and Roberts, 1966; Rohrman, 1968; Herriot, 1968; MacGinitie and Tretiak, 1971; Wearing, 1972	Sentences with low mean word depth comprehended and recalled better than those with high mean word depth (but see Rohrman for a criticism).

As such, they are subject to modification as newer data continue to become available. In addition, the studies have sometimes been done only with single sentences, since experimental work with passage-length materials is difficult. Consequently, the suggested changes are far from rules and should not be made mechanically.

First, not all potentially difficult sentences should be changed. Sentence variety adds to the pleasure of reading, and is probably desirable even in the simplest writing. We need information on when (in terms of age or reading skill) various constructions can be readily understood by readers, and such work is beginning.

Second, sentence changes are often most effective when potential word changes are considered at the same time; in fact, studies indicate that changing only one or the other in an entire passage may not make it any more readable than it was. Both kinds of changes should be made together when this can be done. And just as mentioned for word changes, good editorial opinion is essential, and the final arbiter.

Making all of the changes suggested at all times, however, is seldom possible; where possible, seldom desirable; where desirable, seldom necessary. Where one or more of the changes are possible, however, they should be considered, since they can often help to make writing more readable. As one writer points out, the changes a good editor would make almost instinctively are frequently the kinds of transformations suggested by the experimental research.

The suggested sentence changes are described in the series of steps below. They should be considered with the above cautions in mind.

1. Look at the sentences in the passage, with particular attention to the longer sentences. Not all long sentences are difficult to understand, but a review is useful because length and difficulty tend to be related. Several kinds of changes can often be made in long sentences.

    a. Look for compound or compound-complex sentences containing conjunctions such as but, for, or because. Dividing such sentences into two by changing clauses to full sentences can make writing more readable. Dividing sentences joined by and has much less effect.

    b. Clause length is important apart from sentence length. Where possible, reduce clause length.

c. Sentences are usually long because they contain complex structures, but complexity may not always be reflected in length. This is particularly true for the kinds of structures that have often been studied in connection with difficulty--transformations. Very briefly, transformations involve rules for rewriting sentences that permit a writer to analyze them into grammatically related parts. These transformations will be defined through examples in the following steps. If you want a more complete description, a good reference is Emmon Bach's An Introduction to Transformational Grammars (1964).

2. Change questions to statements, where this is possible and a high degree of text simplification is desired. A possible change would be to transform Could the other driver have been blinded by the sun? to The other driver could have been blinded by the sun. Once again, do not interpret this suggestions to mean that all questions should be avoided.

3. Change negative to affirmative statements where possible and acceptable. For example, The man who designed the Brooklyn Bridge is not alive could be changed to The man who designed the Brooklyn Bridge is dead. Relating such a change to sentence complexity is easier when a more complex sentence is involved. This is George Washington's Mount Vernon mansion, or even Is this George Washington's Mount Vernon mansion?, are both preferable in most acceptable cases to Is this not George Washington's Mount Vernon mansion?

4. Change passive to active sentences where possible and acceptable, particularly where the statements are "reversible." The superiority of active over passive form is found most clearly in such statements. An example of a reversible sentence would be Jack jumped over Jill. Jill could possibly jump over Jack, and this must presumably be kept in mind. In an irreversible statement such as Jack jumped over the candlestick, the unlikelihood of the candlestick jumping over Jack simplifies the matter for the reader. Changing Jill was jumped over by Jack to active form is more helpful to the reader than changing The candlestick was jumped over by Jack. Note, however, that when the passive form is used for a particular kind of emphasis, a change to active form may be undesirable. This is particularly important if you reverse the order in which events actually occurred when changing from passive to active form. For example, the change from The raindance was performed before they planted the corn to They planted

the corn after performing the raindance would probably cause a loss or error in memory. Also, while full passives are clearly harder than active form, truncated (shortened) passives are little if any harder. Examples of full and truncated passives would be sentences such as They were taken to their seats by the usher versus They were taken to their seats. Even in such cases there is some superiority of active over passive form, however.

5. Change (or avoid) self-embedded sentences where possible, since even skilled readers tend to misinterpret them. An example would be The car the man the dog bit drove crashed. If such a sentence is needed, inserting relative pronouns aids comprehension. The sentence might then become The car which the man that the dog bit drove crashed. Changing to a "right-recursive" or "right-branching" form, such as This is the dog that bit the man that drove the car that crashed, is still better. Both right-recursive and left-recursive sentences, such as Lincoln's doctor's wife's dog bit the driver of the car and it crashed, are easier to understand than self-embedded sentences. Constructions that contain more than two self-embedded clauses are uncommon in English, and are almost incomprehensible even to skilled readers. Right-branching constructions of a simple sort using relative clauses are, however, more common and much easier to understand.

6. Change constructions that are high in word depth to ones that are low (when possible). Word depth, as indicated earlier, refers to the "commitments" words have as parts of a sentence; the reader must presumably remember these commitments as he reads through it. Sentences with many modifiers, particularly complex ones, contain words with high word depth. An example is He, whom we saw in New York City, which we visited shortly before Christmas despite the bitter weather, is now in Europe. Victor Yngve has devised a scheme to assign depth numbers to words. The procedure is complex, however, and need not be given here. It is enough to say that this sentence, as others like it, can easily be changed to a more readable form: He is now in Europe. We saw him shortly before Christmas in New York City, in spite of the bitter weather.

7. The above changes suggest that the easiest sentence to understand is a simple, active, affirmative, declarative (SAAD) sentence--just as some teachers of writing have said. The changes may also suggest that the more "transformations" from the SAAD structure, the less understandable the sentence becomes. This,

is not necessarily always the case. There seems little doubt, however, that high word depth and self-embedded structures are among the major contributors to difficulty of understanding, at least as far as raters are concerned.

Even such complex constructions may contribute to difficulty chiefly because we see them so little. Frieda Goldman-Eisler and Michele Cohen (1970) have recently pointed out that SAAD sentences make up 80-90 percent of the prepared and spontaneous speech of such varied groups as eminent lecturers and schizophrenics. Negative and passive constructions make up only seven percent to ten percent of such speech, and passive-negative constructions (and self-embedded structures) are practically non-events. There is now even some evidence that practice on self-embedded structures helps readers to understand new ones.

Whatever the reason for their effectiveness, their simplicity of grammatical structure or their frequency, SAAD sentences are usually very clear. Difficulty of a passage, then, becomes a matter of how many other, more complicated structures are included among them. Variety is desirable, but too many complications are not.

8. To summarize sentence changes briefly, a writer can help to locate sentences which need changing by keeping three questions in mind as he reads:

   a. Is the sentence long and complex?

   b. Will intended readers understand the sentence?

   c. Is the variety needed, or should I simplify the sentence?

To summarize this section, we might describe readable prose as containing many content words that are short, frequent or familiar, concrete, and high in association-value; and, in addition, high in active verb and low in anaphoric constructions. The sentences in readable prose would tend to be short, active, affirmative, declarative, low in word depth, and not self-embedded. (In addition, readable prose would of course need other qualities--careful organization, proper emphasis, well-thought-out examples, etc.--that we cannot yet specify so well.) Not-so-readable prose, on the other hand, would contain many content words that are long, infrequent or unfamiliar, abstract, or low in association-value; and, in addition, high in

nominalizations and anaphoric constructions. Many sentences in such prose would be long, passive, negative, interrogative, high in word depth, or self-embedded (plus other unfortunate characteristics).

An example that has most of the not-so-readable characteristics listed above is the following: Is this not the malt the rodent the feline the canine aggravated slaughtered consumed that was contained in the residential construction of Jack's? The sentence is a nursery rhyme made unfit for the nursery but kept grammatically correct. It can be made fit again for even an unskilled reader by changing the words and sentence constructions along the lines suggested above. Take a look at the sentence again before reading farther and see how many changes you can make and if they would agree with those below.

1. Word changes (note that many of these changes could have been made on more than one of the bases given earlier).

   a. abstract to concrete: change rodent to rat, feline to cat, and canine to dog.

   b. low to high association-value: change feline to cat and canine to dog.

   c. low frequency/familiarity to high frequency/familiarity: change consumed to ate, aggravated to teased, slaughtered to killed.

   d. long to short: change aggravated to teased and slaughtered to killed.

   e. nominalization to active verb form: change residential construction of Jack's to house that Jack built.

   f. result of word changes: Is this not the malt the rat the cat the dog teased killed ate that was contained in the house that Jack built?

2. Sentence changes (note that the changes may be interrelated and that the changed sentences are abbreviated for convenience).

   a. negative to affirmative form: Is this not the malt . . . Jack built? to Is this the malt . . . Jack built?

   b. Interrogative to declarative form: Is this the malt . . . Jack built? to This is the malt . . . Jack built.

c. passive to active form: This is the malt . . . was contained in the house that Jack built to This is the malt . . . lay in the house that Jack built.

d. self-embedded without relative pronouns to self-embedded with relative pronouns: This is the malt the rat the cat the dog teased killed ate . . Jack built to This is the malt that the rat that the cat that the dog teased killed ate . . . Jack built.

e. self-embedded to right-branching form: This is the dog that teased the cat that killed the rat that ate the malt that lay in the house that Jack built.

f. reduced to simplest form, if desired: Jack built a house. Some malt lay in the house. A rat ate the malt. A cat killed the rat. A dog teased the cat.

Few, if any, sentences you will encounter in English will have as many different kinds of complications as that above, although some, like this one, will have phrases that increase word depth or connectives (like although) that can be handled differently, or just plain long words (like encounter) or sentence length that can be changed. Many words and sentences can be changed to make them more readable. This does not mean that we would always want to go as far as step f, of course; we would do so only if we wanted to reach beginning readers.

What we need to aim for is adjusting writing and rewriting to the skill and motivation levels of one's intended readers. What we want is material neither so hard nor so easy that it turns readers to other activities. The next chapter (V) discusses reading skill, or competence; Chapter VI takes up level of motivation; and the last chapter (VII) describes ways to estimate whether we have achieved a desirable match between writing and reader.

CHAPTER V

THE READER'S LEVEL OF COMPETENCE

Writers as a whole will agree that greater knowledge of their readers can help them to produce more readable writing. Surprisingly, few books on writing say anything very helpful about readers and how they read. Yet this is necessary to understanding or evaluating reader competence.

Why is information on readers and reading not given? Not because there is none available; a recent survey found around 15,000 reading studies available. Perhaps it is because of the information; there seems too much to make sense of. The temptation may be to visualize so complex a picture of this admittedly complex process that it cannot be helpful.

The description given below focuses more narrowly on the mature reader (of English), because this is most appropriate for users of this manual. The term "mature", as mentioned in the second chapter, refers to level of reading skills rather than to age. The beginning reader is excluded, because he has additional problems not faced by the experienced reader.

The description covers certain long-known facts about reading but also brings in recent interpretations that have proved useful. John Carroll (1970) gives traditional view of reading, while Kenneth Goodman (1970) and Frank Smith (1971) provide new and interesting viewpoints that are rapidly becoming more widely accepted. Information that can help the writer understand reading as a process will be emphasized. Additional information about reader competence will follow this, along with a statement of the implications of the chapter for the writer.

What kinds of movements are our eyes making as they move along a line of print like this? Though it may seem they are moving along smoothly, they actually are not. Instead, they are making a series of brief pauses, with quick movements between. If you want to observe this, have someone hold a book near eye level and read the top line silently while you watch his eyes over the top of the book.

The "fixations" on the line typically last about one-fourth second. Only during these pauses is anything seen clearly; vision during the in-between movements is unclear, and we learn to ignore what is seen. Another thing we learn to ignore is the material above and below the line we are reading. We must do this, since the "visual field" is roughly circular and we see a good deal (as a child does) that would otherwise be distracting.

What we do see clearly, in the central part of our fixation, is typically from one to three or four words. How many depends, among other things, on their length, their familiarity to us, the light on the page, and our visual apparatus (if we are severely handicapped). We also get a general impression of several words, even though we cannot see them clearly.

We do not need to see all the words clearly to recognize them, however. How clearly we need to see them, and even how much of them we need to see, depends to a large degree on how often we have seen them in the past (an important consideration for writers). We also tend to "fill in" what is not clear from the sense of the sentence, associations based upon previous words, etc.

Surprisingly, what we actually "see" is not well understood. We are often not conscious of the spelling or phonetic values of the words, for example. Yet we do see important cues or "distinctive features" of some kind. We seldom confuse hop, pop, cop, and mop, for example. The beginning and ending letters seem especially well noted, and the serifs (the riser in "h" and the descender in "p," for example) act as cues. But we do not concentrate on letters, or even on the general shape of the word as such. The most important things seem to be how often we have seen particular words before and how competent we are as readers--in such cases, minimal cues are needed. We then say we have a good "sight vocabulary" or that we have good "immediate word perception."

If we have not seen a word before, of course, this procedure changes somewhat. We do have to pay attention to letters, and to our knowledge of phonetics and spelling. This process of "mediated word perception" often then permits us to do a good job of pronouncing words. As Carroll points out, we realize that the strange word dossal rhymes with fossil and the unfamiliar latescent is pronounced like fluorescent rather than late and scent.

As far as words are concerned, we tend to pay more attention to content words than to function words. We also pay more attention to subjects than to objects, and in general to words that occur early in the sentence.

All of this process, for the mature reader, may take place very rapidly during a brief fixation. Moving left to right, we typically take about two such fixations per inch. (This does not include some brief adjustment fixations we may take, and there are rather wide differences in fixation patterns and rate and accuracy of comprehension.) What is seen during a fixation remains briefly as a "visual image" and then passes into what is usually called "short-term

memory." Unless we rehearse what is seen, short-term memory will hold only about four or five separate items. You can see something like this for yourself by observing the "eye-voice" span. If you ask a friend to read a line of text aloud, then turn off the light he is using unexpectedly in the middle of a sentence, you will find he can typically continue for up to four or five words. His eyes are that far ahead of his voice, with the material being held in short-term memory.

Material next passes into "long-term memory." The term "material" is important, because it is clear that only the "gist" or general meaning of what we read gets in, not all of the words. There seem to be few limits on amount in long-term memory, except that it takes a rather long time to get material in (one estimate is that only one item can be entered every five seconds or so). A filtering process is clearly taking place.

One of the processes that seems to be occurring as we read is the development of "expectations" or hypotheses of what is to come. The perceptual, meaning, and syntax (sentence) cues lead us to expect certain ideas, if not words, to follow. If what we expect is confirmed by following fixations, we go on reading rather smoothly. If not, we are likely to adjust our fixation or focus or even return to the area of a previous fixation (this is called regressing), before moving forward again. Generally, left-to-right predictiveness seems to be quite important in our processing of sentences.

One thing we as readers do not like is to get either too much or too little new information at one time. If it comes too fast (one very rough estimate is more than about 40 percent new information in a passage), we are likely to be frustrated; if it comes too slowly, we are likely to be bored. Unfortunately, there is no good way to describe how to stay within such limits. We can get an intuitive notion, but a clearer description will have to wait until we understand "comprehension" better. You might think that, for all the years people have been teaching comprehension, they could by now at least agree on a definition. This is not so. We can, however, say that comprehension may affect the number and rate of fixations, and particularly regressions. We also find that, in addition to the "plain sense" of a message that we get almost immediately, we are also more slowly comprehending the implications of the message--drawing inferences, judging truth or falsity, determining acceptability, etc. And, finally, we tend to remember sentences from the beginning and end of passages better than those in the middle.

Beyond this, as we read larger amounts of material, we gradually build up a meaningful whole from what we have been taking in. Reading, in other words, is thinking or reasoning, as the pioneer psychologist, Edward L. Thorndike, recognized

over 50 years ago when he launched the first real study of comprehension. It is this processing that permits us to read with sense. As Carroll says, we know that sometimes the word read should rhyme with bead, but that in another context it should rhyme be bed. The meaningful message we have been constructing in our heads tells us which is which, not our eyes. Smith describes the proper emphasis by saying that the brain tells the eye more than the eye tells the brain.

With this very brief look at how the mature reader reads, we can turn to the question of the reader's competence. It appears to depend heavily upon the following factors.

1. The reader's knowledge of the language he is to read. Without a thorough knowledge, especially if it is a first language, the brain cannot build up the background for its contribution to the reading process, and reading occurs only very slowly and haltingly. We all too easily forget that even the beginning reader is already an accomplished speaker. If, for some reason, he is not, his reading suffers.

2. The reader's level of education. In general, the higher the school grade a reader has reached, the better reader he is, at least up to college age. Level of education is, however, as much an index of reading competence as a cause. More years of schooling expose a reader to particular words and word constructions many additional times, so he reads the words and sentences faster than a reader with fewer years of schooling. He knows the meanings of more words and word combinations, also, so he reads with greater comprehension. But both effects could come from extensive reading by a person with relatively little formal education. In this sense, level of education is only an index of competence, but a very useful one because most persons with little formal education are not wide readers.

3. The reader's field of interest. A reader will, as a matter of course, see words and phrases related to a field of special interest to him many more times than others that occur equally often in the language as a whole. Once again, this results in faster reading and greater comprehension. Space does not permit a thorough discussion of specific reader interests, since they are so varied. These general findings may be useful, however: adults like to read about themselves or someone like themselves, and they like to read in and about their professional or occupational area. They also like to read about health, personality, and human nature (how to get along with others, particularly). Peace has also

long ranked high. They do not particularly like to read about child fantasy, commercialism, and about writers and writing (unless they are writers, or aspire to be).

Of what use is this information? Isn't getting the reader's level of competence just a guess, or a risky judgment at best, unless you have a test score? Test scores are usually hard for writers to get, even for small audiences; for mass publications, they are usually out of the question.

What can be done? Level of education usually provides a good rough estimate of a reader's level of competence. As noted, exceptions do occur, where the last school grade a reader has reached is not a good index. Since, however, the level of difficulty of writing is usually also estimated in terms of grade level, a rough match between reader competence and difficulty level of writing is possible with this measure. (How to judge difficulty, readability, of writing will be discussed in Chapter VII.)

What implications does this chapter have for writers? Here are some of them.

1. Reading is a skill, something like skating or cycling. The reader who does not practice loses the skill--even faster, usually, than the over-practiced motor skills mentioned. That is why many persons who have once learned to read, later in their lives become functional illiterates. Unless material at their level and of interest to them is available, they cannot or do not read, and lose their skill. This is especially the case for readers who have not progressed beyond fourth-grade level. About all they can read are comic books; even newspapers are not generally satisfactory. Just as reading skill can be lost, it can also be strengthened. Material roughly at the reader's level of competence provides for this. Several factors complicate this simple picture, but they are best left for the next chapter. Most important, though, is that the level of difficulty of writing--and related information rate--should fit the reader's level of competence so that he gains skill rather than loses it.

2. Help the reader form "expectations" of what is to come as he reads. Again, as Bertrand Russell said, do not let the beginning of a sentence lead the reader to an expectation contradicted by the end of it. The same may be said for larger units than sentences. Avoid, in other words, giving the reader miscues.

3. Remember that reading is only incidentally visual. As a writer, one should focus on helping the brain to understand more than on helping the eye to perceive. That is, emphasize words and constructions that a reader has had previous exposure to and experience with.

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CHAPTER VI

THE READER'S LEVEL OF MOTIVATION

(PLUS RELATED READING CONDITIONS)

We tend to forget when writing just how many kinds--or, rather, levels--of motivation readers have for reading. Observations show that motivations may easily range from "reading to learn" to "reading to forget." Few writers (successful ones, at least) would write light novels or mysteries the way textbooks are written. Perhaps textbooks should not be written in as difficult style as they often are, for that matter; certainly many could be improved. But since readers approach novels and textbooks with different motivation, textbook writers can get away with a somewhat more difficult style.

Perhaps the best way to look at this is through the "principle of least effort." The principle says, in effect, that a person will expend the least amount of effort necessary to reach a given goal. That is something of an oversimplification, of course, because we do not always know what path will involve the least effort--or sometimes even what the goal is, very clearly. Generally, however, we have some idea of each, and can modify our behavior if these ideas change. In other words, "expected effort" will vary with "expected reward." For writing, the matter is made even clearer, perhaps, by the so-called Yerkes-Dodson law: the level of difficulty of a task that a learner will attempt varies with his level of motivation.

However stated, the principle does work and is a very general one. O. H. Mowrer provided a good example. He and his wife (both psychologists) decided that they would see how their baby daughter's begging behavior changed when their handling changed. At first, she would cry and hold up her arms when she wanted to be picked up. Her parents tried very hard to pick her up as soon as she did this. The crying rather quickly dropped out and only the arm-raising remained. They continued to respond just as soon as possible by picking her up. Next only one arm was raised; then only one hand; and, finally, only a finger was flicked. The little girl was responding with the least effort necessary to reach her goal of being picked up. What do you suppose happened when she was no longer picked up for her least-effortful response? She went back, of course, to her full response of arm-raising and crying.

George Kingsley Zipf, who named the principle of least effort and examined it thoroughly, has other more complex

examples of its presence. The important thing is that the principle applies very clearly to reading also. One excellent example comes from a fair where three booklets on fruit growing and cultivation were prepared for free distribution. All covered the same topic, but differed in level or reading difficulty. One,intended for 4-H club members, was easiest to read; another, intended for fruit farmers, was hardest to read. The third, prepared for general farmers, was in-between in difficulty.

Labeled piles were made of each booklet, and they were placed on a table where passers-by could pick them up. Each pile, at the start of the fair, contained a number of booklets proportional to the number of 4-H members, general farmers, and fruit farmers expected. Observers noticed, however, that all three categories of potential readers, after a bit of paging through, tended to select the 4-H version, and it disappeared first. Next went most of the general-farmer version, and last and least went the most difficult version of all, that intended for fruit-farmers.

This principle of least effort is a powerful determiner of reading, but of course it says nothing specifically about the range of motivation to be found among readers. Nor does it say (to any extent, at least) how motivation can be managed.

We have already noted that reading motivation ranges from the desire to learn to the desire to forget (i.e., be diverted, such as when reading light novels as a bedtime activity). Actually, the range is even somewhat greater. Possibly the best way to describe it is as a range from "overcompensation" at one end to "casual perusal" at the other. Compensation can be defined readily by example. A study of some years ago looked into the effect of noice on typists' efficiency. One group of typists worked in a quiet room, one in a noisy one, but both on the same typing material. The two groups typed about equally well, in terms of amount of work done and errors made. The investigators were puzzled, but someone happened to notice that the typists working in the noisy room seemed more tired at the end of the study. Effort indicators (springs) were then placed under the keys for a following study. As expected, the typists in the noisy room were using more effort in reaching their level of performance than those in the quiet room. Those in the noisy room appeared to by trying to live up to their own standards of performance (it was a "test," after all), and in order to do so had to "overcompensate" for the noise.

This is compensation in general; how does it show up in reading? The reader may do any one or more of the following to compensate for difficulty.

1. Reread the material one or more times.

2. Use a dictionary, thesaurus, or other potentially useful aid.

3. Get other material on the same subject in the hope of better understanding.

4. Talk to other persons who are more knowledgeable.

Richard Kern, Thomas Sticht, and Lynn Fox (1970) found that servicemen would ask others for information to the extent they found their reading material too difficult for them. We all do this on occasion; a common case is the filling out of income tax forms.

Readers can and will compensate for difficult reading when they are highly enough motivated to do so. The level of difficulty of a particular piece of writing becomes less important then compared to when motivation is lower. Even readers with little competence will struggle, or at least try to struggle, through it, but they welcome an easier task. As a writer, an extra hour of your time in rewriting can save your readers many hours of their time, as pointed out earlier. If you want their good will, or hope they will read your writing again later, a style that is easy to read is good insurance.

Writers, though, like testers of intelligence, will always hope their particular readers have a very high level of motivation. Not only can this compliment them and make their job easier; greater understanding and/or higher test scores also result. Unfortunately, readers seldom have as high a level of motivation as we think they will have. Nor do they usually have the very low level of motivation I have called "casual perusal" when they are reading for information or instruction. This level occurs, for example, when a reader is paging through a newspaper or magazine because he has nothing more engaging to do.

The level of difficulty of reading matter is important to a casual reader, but less so than the topic involved. If he doesn't find something that fits his interests, his mood of the moment, or that is striking for some other reason, he may pass by even the most readable material. Note, however, that easy reading may hold even the casually interested reader on material that hard reading would turn him away from.

So, difficulty does matter for the casual reader. But it matters even more for that large group of readers between this extreme and that of overcompensation. Most readers fit somewhere in this middle category. Reading difficulty is important to them, especially important if what they are reading is long. Irving Lorge once made a study of the readability of consecutive issues of a digest. The editors seemed pleased at first

by the work, but later became concerned when he pointed out that the circulation of each new issue was related to the readability of the previous issue. When readability scores were low, readership of the following issue was low also; when scores were high, readership went up next issue. As low scores touched the editors' pet articles in various issues, their concern turned to disenchantment and Professor Lorge's funds were stopped. He continued to compute the readability scores of the following issues for his own information, and found that a succession of low scores soon put the digest out of business.

A number of other studies have shown essentially the same kind of result. The difficulty of writing does make a difference for the reader with average motivation. What, though, can be done to determine motivation? What are the important factors? Researchers have been working on this question long enough to tell us that no easy answers are available. Some findings seem clear, however, and we can at least start on them. Remember that a very high level of motivation, if it can be achieved, reduces the importance of readable writing. The levels below this, on the other hand, increase its importance. Even when motivation is high, however, there is a tendency for greater comprehension in less time when reading more, as opposed to less, readable writing.

When is motivation to read likely to be high?

1. When interest in the subject-matter is high. Keeping a reader interested--once he has decided he is willing to give a piece of writing a try--is therefore in order.

2. When content knowledge is relatively high. The word "relatively" may seem out of place, but is included because a reader is seldom interested in a piece of writing that tells him nothing (or very little) that is new. Too much new information, of course, also drives a reader away, as we saw in the last chapter. In the terms used earlier, information gain should be held to an intermediate level; either too much or too little turns readers away.

3. When the stakes are high. Researchers and testers have known this for a long time, which is why subjects are often told (or led to believe) that an experiment or test will contribute to course grade, indicate intelligence, show ability, etc. Manipulating instructions in such a way is not easy unless the reader is in a classroom. Even then, the reader's personal stakes must be high if such instructions are to work.

Instructions designed to motivate the reader are likely to be helpful only when the testing situation is appropriate. An example comes from a personal review of almost 30 experiments in which a more readable version of material was pitted against a less readable to see if the former would result in higher scores on a comprehension or learning test. Nearly three-fifths of the studies produced positive results, while slightly over two-fifths were negative (usually no difference in comprehension scores). Many of the studies were doctoral dissertations, and it was possible to get microfilm copies of them and study in detail what the experimenters had done (most reports of studies in scientific journals have too little detail for this).

Given the high stakes mentioned above, several of the following were also necessary if high motivation was to produce high scores on the less-readable versions.

1. The test had to be sufficiently sensitive to show experimental differences. As obvious as this may seem, some studies failed because the test appeared to be insensitive to differences in comprehension.

2. The time limits given to the subjects were lenient. Without the necessary time, the extra effort resulting from overcompensation was not likely to produce higher scores.

3. Re-reading of the experimental text was permitted. Where experimental conditions permitted only one reading, differences in test scores seldom appeared.

4. Reference to the text was permitted while answering the comprehension questions. This is the way many reading tests are arranged, and higher scores result than when reference to the text is not permitted.

What relevance does this kind of description have for a writer? He cannot usually control the reader's motivation or the reading (testing) situation. He must, therefore, guess what his readers' situation is going to be. How much detail does he need to get from the writing? Will he probably have time to re-read? More important, is he likely to take the time to re-read? Will he usually have the written description around when he needs to perform a task? Will he refer to it? Unless motivation is high, these questions are very important. It is all too easy, unfortunately, to assume a higher motivation for readers than they are likely to have.

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What other implications for writing can be drawn from this chapter? Since the principle of least effort plays an important role in reading, a writer might well try to do one of the following.

1. Raise the level of expected reward. This can sometimes be done by indicating the importance of what is being read, or its relevance to the reader's life. Technical writers, especially, often have good opportunities to do this.

2. Reduce the level of expected effort. This approach is basically one of making writing more readable--easier to read. The next chapter tells how to judge when you need to consider this.

CHAPTER VII

THE READABILITY LEVEL OF WRITTEN MATERIAL

Chapter II pointed to two problems in readable writing: prediction and production. The matter of predicting readability, it was said, though not exactly easy to do well, was relatively simple compared to producing readable writing. The two processes are actually quite different in nature. Consequently, this chapter will focus on prediction as Chapter IV did on production (writing).

Writers, particularly those in education and the mass media, have for a long time faced the problem of determining the level of readability of a piece of writing. Educators know that writing which is too hard or too easy for intended readers will fail to instruct them. Similarly, writing that is not acceptable to readers of the mass media will turn them away rather than inform them.

How can writers judge whether their writing is at a level appropriate to their readers? A number of methods can be used, varying in ease and in accuracy. The first and most common method is to guess. How good a writer's estimate will be depends heavily upon his experience and upon feedback. Unfortunately, writers do not often get feedback as speakers do; writing is a much more remote or detached medium. (Personal letters and such are, of course, an obvious exception.) Writers often have a human tendency not to see the difficulties in their own writing. If, in addition, they are experts in their field and their readers are novices, the problem is increased. At any rate, writers are usually less accurate in judging the difficulty of their own writing than that of others, usually believing it to be easier to read than it is.

This suggests a second method of judging the difficulty of writing: asking others to help. This is a good procedure, since groups of 30-50 judges can reliably rank pieces of writing in order of their difficulty. There are two problems with this method, however. First, one has to find 30 or more cooperative judges, if he can. Second, one can only ask them to give relative judgments--whether one article is more or less readable than another. Helpful as this can be, what a writer often needs most is some more specific judgment of the probable difficulty of a particular piece of writing.

This in turn suggests another method: testing a piece of writing on a sample of potential readers. Testing is the

most accurate method of all, but the most laborious. Few writers other than pollsters do this, even though it comes closest to giving a specific level of difficulty.

The method of judging readability that has grown recently is using a readability formula, as noted in Chapter II. Formulas are developed by studying the relationship of various style variables in passages of text, such as percentage of prepositional phrases, percentage of abstract nouns, percentage of infrequent words, etc., to scores of readers on comprehension tests on the passages. When high relationships are found, these variables are combined statistically into a formula that yields a score indicative of the difficulty of a particular passage. Literally hundreds of such potential index variables have been studied. One researcher alone studied well over 150 before settling on those he wished to use in his formulas.

Studies have shown that proper counts of two simple variables like word length in syllables and sentence length in words (from among the hundreds studied) can do a good job of prediction. They can hadly be improved upon, either by using more--or more complex--variables. In fact, using many variables not only makes prediction harder but may actually also make it less reliable.

Production, as we saw in Chapter IV, is another matter. Mechanically changing word length and sentence length when writing or rewriting does not make material correspondingly easier; here, more--and more complex--changes are needed. Only for prediction are two simple variables sufficient.

One reason for this predictiveness is that elements of language are often highly inter-related. For example, it has been shown that word depths per sentence, a very complicated measure, is very highly related to the simple count of number of words per sentence in a large sample of writings, and that number of letters per 100 words is almost perfectly related to number of morphemes per 100 words, again a more complicated measure. It is not necessary or desirable for the predictor to use a complex element when a simple one will do. The producer of readable writing, on the other hand, is often hampered by the fact that language elements are inter-related. When he changes one variable, others often change also and he cannot tell what has (or has not) been effective. Writing readably is therefore much more difficult to do well that is predicting when writing will be readable.

The greater ease of predicting than of producing readable material should not imply that readability formulas are perfect predictors. For one thing, all such formulas to date

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use only style variables. Other variables, such as the content or topic itself, the interest-value of the content, differences in format, various organizational arrangements, etc., are also important. Formula developers do not deny this; they simply know of no objective way to include such variables.

Despite this obvious lack, many formulas have been found to do a good job of predicting difficulty. Statistically, they do somewhat better than tests used to predict student success in college. Though not perfect predictors, they clearly do better than individual judges or even groups of judges.

Chapter II pointed out that well over 50 such formulas exist. Why are there so many? Some were designed for children's material, some for adult material. Or they were developed for Spanish or German or Hebrew as well as (in most cases) for English. Or they were planned for application to tests, to military material, or to mathematical text. But even among those for adult material in English, a great variety are available. Some are too simple to give reliable results and some too complex to give reliable results. Some are designed for research, but are too cumbersome for practical application; among them are some for computer application. Still others, clearly, were developed to gain a Ph.D. degree for their authors.

How can one choose among so many formulas if he wishes a relatively simple but sufficiently reliable measure? Several formulas fit this need very nicely, the most commonly used being the "Reading Ease" formula of Rudolph Flesch (1948) and the formula developed by Edgar Dale and Jeanne Chall (1948). Several other formulas developed recently appear to be more accurate than these, but the differences are small when they are tested under similar conditions. Furthermore, even the best of formulas under the best of conditions are not perfect predictors. They give quick, easy estimates of reading difficulty, but certainly not highly accurate measures. Furthermore, a graded level of difficulty may easily be surpassed by a highly motivated reader--or be an underestimate for a poorly motivated one.

The Flesch formula is the only one described here because it is simple to apply and does not, like Dale and Chall's formula, require a word list for application. The Flesch formula involves only two counts in a 100-word sample of written material: number of syllables per 100 words and average number of words per sentence. These values, entered in the formula, or found in the Farr-Jenkins tables (1949) for easier use, give a "Reading Ease" score, which can in turn be translated into a grade level of reading difficulty.

The formula will not be presented here in its entirety because it is available in several of Flesch's publications (1949, 1950). Here, however, are some typical (not exact) values showing how the indices of difficulty vary across the several grade levels. They are based on Edward B. Fry's graph (1968).

Grade Level of Writing	Typical Average Number of Syllables per 100 Words	Typical Average Number of Words per Sentence
1st	120 or fewer	7 or fewer
2nd	120-121	7.0- 9.0
3rd	121-123	9.0-11.5
4th	123-124	11.5-13.3
5th	124-126	13.3-14.3
6th	126-129	14.3-17.2
7th	129-137	17.2-20.0
8th	137-142	20.0-20.8
9th	142-149	20.8-22.2
10th	149-153	22.2-23.2
11th	153-158	23.2-23.5
12th	158-162	23.5-24.4
College	162-169 or more	24.5 or more

This table emphasizes two points.

1. The differences between adjacent grade levels are quite small. This is satisfactory for index purposes, but it also tells why making small rewriting changes in order merely to improve the indices does not necessarily improve the writing.

2. Getting accurate counts is critical to getting accurate readability scores, and questions of what to do occasionally arise when you apply Flesch's formula. How should you handle abbreviations like A M or TV? Numbers like 4:23 or 1973 or 1,932?

Part 2 of a booklet by George Klare and Lawrence Campbell (1967) gives the Flesch formula, the Farr-Jenkins tables for getting scores, some trial passages with scores determined, and suggestions on how to handle application questions you are likely to raise.*

If you have a lot of material to analyze, an automated version of one of the readability formulas might be considered. Remember, however, that getting the formula program operating on your own computer, if you have one and if the developer will

*This booklet is available at cost--50¢--from Quill and Scroll, School of Journalism, University of Iowa, Iowa City, Iowa 52240.

part with his program, is not always easy. Getting the developer to run material for you is often much simpler (and cheaper) in the end. And, unless you have a rather large amount to analyze, a hand analysis is both simple and cheap.

Now how should a formula be used? To begin, apply it to a piece of writing to see if the writing is likely to be appropriate to your reader's levels of reading competence and motivation. If it is, you may want to stop there (remembering, however, that even a competent and motivated reader welcomes a somewhat easier reading task). If your writing appears too difficult for your reader, or you want to help him, you will need to rewrite. The next step is crucial: do not "write to formula." Specifically, do not rewrite merely to make readability formula scores better. It does not work out well, as noted earlier. Not only will the writing seem mechanical if you chop sentences and make arbitrary word changes, it will also be ineffective in changing reader performance.

Formulas are for <u>rating</u>, not for <u>writing</u>. Since the variables in the formula were selected only as indices of difficulty (as described in Chapter II), changing them does not necessarily cause the difficulty of the writing to change accordingly. What you frequently get when you make such changes is an artificially altered readability score, one that is not reflected in increased comprehension by the reader. The changes needed in rewriting are more subtle and complex than a formula can suggest, as Chapter IV indicated.

Once your material has been rewritten (without regard to the formula), <u>then</u> apply the formula again. If the material now appears to be appropriate, fine. If not, rewrite again and apply the formula again.

If this business of checking readability, rewriting, checking again, then rewriting again, seems time-consuming or diffult--it is, at first. After some experience, however, you usually get a feel for the appropriate level for a given body of readers, and the process gets much faster and easier. Readers are likely to be turned off by writing that seems unnecessarily difficult. Your extra time will not only save <u>time</u> for them, perhaps even thousands of hours; it will also encourage them to read more of what you have written. And that is what readable writing is all about.

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